TRAUMATIC BRAIN INJURY IN ADULTS

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The mortality of severe TBI (post-resuscitation Glasgow coma score ≤8) in adults is around 25%, with over 60% of survivors having residual deficits including cognitive impairment and behavioral problems that affect their functional status and quality of life. Advances in the understanding of the pathophysiology of brain injury and developments in monitoring and imaging techniques have allowed a movement away from rigid physiological target setting toward an individually tailored, patient specific, approach to management.

Acute Management

Resuscitation and early management of TBI is a crucial stage at which mortality and morbidity can be influenced. In particular, the prevention of secondary brain injury by correction of hypoxemia and hypotension, and rapid diagnosis and evacuation of an expanding intracranial haematoma, are key determinants of outcome.[1]

Intensive Care Management

The intensive care management of TBI is complex and requires a coordinated and stepwise approach providing general intensive care support and interventions targeted to the injured brain.[2] Modern management utilizes a host of intracranial monitoring techniques to identify or predict the occurrence of secondary cerebral ischemia and guide therapeutic interventions in an attempt to minimize secondary brain injury.[3] Consensus guidelines for the management of TBI are available and the most comprehensive, from the Brain Trauma Foundation, have recently been revised.[4]

General aspects of treatment

The management of severe TBI has undergone extensive revision as evidence accumulates that longstanding and established practices are not as efficacious or innocuous as previously believed.[5] Traditional therapies, such as fluid restriction and routine hyperventilation, are detrimental and no longer recommended, and newer therapies, such as therapeutic hypothermia and tight glycemic control, remain controversial.

Systemic physiological insults, particularly hypotension and hypoxemia, have adverse effects on outcome; even brief periods of systemic hypotension are detrimental and should be meticulously avoided.[6] Euvolaemia is the primary cardiovascular goal and intravascular volume should be maintained with isotonic crystalloids and colloids. A vasoactive agent, such as dopamine or norepinephrine, should be added if adequate arterial blood pressure is not achieved with fluid resuscitation. General intensive care principles should be applied in all cases and glycemic control, pyrexia management, early enteral nutrition, seizure management and venous thromboembolic prophylaxis are of particular importance.

Physiological neuroprotection

The sole goal of identifying and treating intracranial hypertension has been superseded by a focus on the prevention of cerebral ischemia by a neuroprotective strategy incorporating a systematic approach to the control of raised intracranial pressure (ICP) and maintenance of adequate cerebral perfusion pressure (CPP). This followed evidence that induced hypertension using fluid resuscitation and vasoactive agents to maintain CPP > 70mmHg is associated with improved outcome.[7] However, therapies to maintain high CPP are controversial because of the high incidence of complications, including acute lung injury (ALI).[8] An alternative, although not widely accepted, approach utilizes a lower CPP target of > 50mmHg with volume-targeted therapy (the Lund concept) that aims to minimize increases in intra-capillary hydrostatic pressure and intra-cerebral water content and thereby avoid secondary rises in ICP.[9] The Brain Trauma Foundation now recommends that CPP after severe TBI should lie between 50-70 mmHg and that aggressive attempts to maintain CPP > 70 mmHg should be avoided because of the risk of ALI.[4] It is likely that a CPP threshold exists on an individual basis and that optimal CPP can be identified by multimodal monitoring. ICP > 20 mmHg should be treated.[4]

Care pathways

Protocol guided therapy provided by a multidisciplinary neurocritical care team is likely to benefit brain injured patients because such teams have expertise in the interplay between the brain and other organ systems and are able to integrate all aspects of neurologic and medical management into a single care plan.[10] The introduction of evidence-based protocols to guide the intensive care management of patients with severe TBI is associated with a significant reduction in ICU and hospital mortality and length of stay, fewer medical complications and improved outcome in survivors.[11] Outcome is also improved when care is provided in a specialist neuroscience unit.[12]

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